REMARKS

Claim 1-25 is pending. Claims 18-25 have been added by way of the present amendment.

Claims have been amended to correct various typographical and grammatical informalities. Claim 10 has been amended to clarify that geometry information "is described by displacements normal to the surface," as supported by, e.g., page 7, line 3-5. No new matter has been added.

In light of assignment of the application to Lucent Technologies, Inc. (recorded at reel 012755, frame 0221), also submitted are supplemental fees to reconcile previous fee payments with large entity status.

In the action mailed August 3, 2004, claims 2 and 13 were indicated as being allowable if rewritten in independent form. New claim 18 includes subject matter drawn from allowable claim 2, subject to deletion of references to the "arbitrary topology" and an amendment that "one vertex of the semi-regular mesh is in a different location then a corresponding vertex of the ~~original~~ input representation". It is respectfully submitted that new claims 18-25 remain allowable despite these changes.

Claim 12 was rejected under 35 U.S.C. § 112, 2nd paragraph as indefinite. Claim 12 has been amended to address the Examiner's concerns.

Claims 1, 3-7, and 9 were rejected under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 6,144,773 to Kolarov et al. (hereinafter "Kolarov").

Claim 1, as amended, relates to method of compression of a surface. The method includes obtaining an input representation of the surface, forming a semi-regular mesh representing a geometry of the surface where at least one vertex of the semi-regular mesh is moved to a different location than in the input representation, and forming a compressed version of the semi-regular mesh.

The rejection of claim 12 contends that Kolarov describes the formation of a compressed version of the semi-regular mesh representing a geometry of a surface.

Applicants respectfully disagree. Kolarov describes the compression of *functions*. See, e.g., col. 4, line 58-61 and col. 12, line 1-3. In Kolarov, it is the data of a function on a manifold that is compressed, rather than the manifold itself. See, e.g., col. 13, line 1-14 and line 43-44. Indeed, when Kolarov compresses a function on a manifold, the function is compressed with respect to the manifold. *The manifold itself is not changed by the compression.* Kolarov therefore neither describes nor suggests forming a compressed version of the semi-regular mesh that represents a geometry of a surface.

Further, Applicants submit that it is not obvious to extend Kolarov to the compression of a mesh that represents a geometry of a surface. As one example, Kolarov's compression of a function relies upon compression relative to a fixed domain (i.e., the surface). On the other hand, when a representation of a geometry of a surface is compressed, there is no domain per se. Rather, the representation itself is changed by the compression process. Any approach like Kolarov's that relies upon compression relative to a fixed domain is thus inapplicable.

As another example, Kolarov does not describe or suggest various tools used to compress representation of a geometry of a surface. For example, to the best of the Applicants' knowledge, the wavelets used to compress surfaces (described on page 13-15 of the present application) were not previously known and hence would have been unavailable to Kolarov.

The rejection of claim 1 also contends that Kolarov's subdivision of a mesh will inherently change vertex locations of an input representation. Applicants respectfully disagree.

Rather than changing vertex locations of an input representation, Kolarov's subdivision of a mesh simply adds new vertex locations to a representation. For example, in col. 17, lines 53-56, Kolarov explicitly identifies that "subdivision [of triangle T1] has produced vertices V1 666, V2 664 and V3 662…"

Thus, Kolarov's subdivision does not inherently change vertex locations, but rather simply adds or produces new vertices in a mesh.

Further, Applicants submit that Kolarov neither describes nor suggests forming a semi-regular mesh where at least one vertex of the semi-regular mesh is moved to a different location than in the input representation. In particular, subdividing a mesh as described by Kolarov simply produces additional vertices without moving the location of the input vertices.

Accordingly, Applicants submit that Kolarov does not render claim 1 obvious and that claim 1, along with the claims dependent therefrom, are allowable.

Claims 10-12 were rejected under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 6,088,034 to Deering (hereinafter "Deering") and U.S. Patent No. 6,201,881 to Masuda (hereinafter "Masuda").

Claim 10, as amended, relates to method that includes obtaining information on a three dimensional part, and compressing said information by allocating bits preferentially to displacements in the local normal direction. The obtained information includes parameter information that is described by displacements in the tangent plane to the surface and geometry information that is described by displacements normal to the surface.

Applicants submit that Deering neither describes nor suggests obtaining geometry information that is described by displacements normal to the surface and compressing information by preferentially allocating bits to displacements in the direction normal to the surface.

Rather, Deering's "surface normals" only describe additional data associated with vertices of the geometry. In particular, Deering's "surface normals" are all unit vectors (i.e., vectors whose length is one) and hence only provide directional, rather than displacement, information. Support for this position can be found throughout Deering. For example, col. 11, line 14-15 expressly refers to Deering's normals as "unit normals," col. 10, line 58-63 refers Deering's normals as on the unit sphere, and col. 10, line 63 - col. 11, line 5 of Deering describes the bit allocation to Deering's normals to represent them in the unit sphere. Since Deering's normals are unit normals, there is no length information in Deering's normals. Rather, they only encompass directional information.

The position that Deering's normals only encompass directional information finds further support in Deering's discussions of the resolution of such normals. For example, at col. 10, line 12-14, Deering describes that 2^{96} different normals can provide a resolution of 2^{-46} radians. This resolution is

presented solely in directional units (i.e., radians) rather than length or other units that would reflect displacements.

Since Deering's "surface normals" only describe additional data associated with the surface, Applicants submit that Deering neither describes nor suggests obtaining geometry information that is described by displacements normal to the surface and compressing information by allocating bits to displacements in the direction normal to the surface.

Masuda, which was also cited in rejecting claim 10, fails to remedy this deficiency of Deering. Masuda describes the embedding of information in a three-dimensional model by, e.g., moving a vertex of the embedded information in the model. Masuda thus has nothing to do with bit allocation in information compression and thus, like Deering, fails to describe or suggest obtaining geometry information that is described by displacements normal to the surface and compressing information by preferentially allocating bits to displacements in the direction normal to the surface.

Further, to the extent that Masuda's watermarking adds additional data to a set of information, Masuda can be seen as teaching away from compressing information. In other words, rather than making information more compact, Masuda describes that the information content of a geometric model should be increased by watermarking.

Accordingly, Deering and Masuda do not render claim 10 obvious and claim 10, along with the claims dependent therefrom, are allowable.

Applicant asks that all claims be allowed. Enclosed is a check for excess claim fees. Please apply any other charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,

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